UNIVERSITI MALAYA

SIH2022 ECOSYSTEM-BASED MANAGEMENT

PERAK NORTH CIVAT AND ISMP

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STUDY AREA

DISTRICTS

- Kerian
- Larut, Matang
- Manjung

MANAGEMENT UNITS

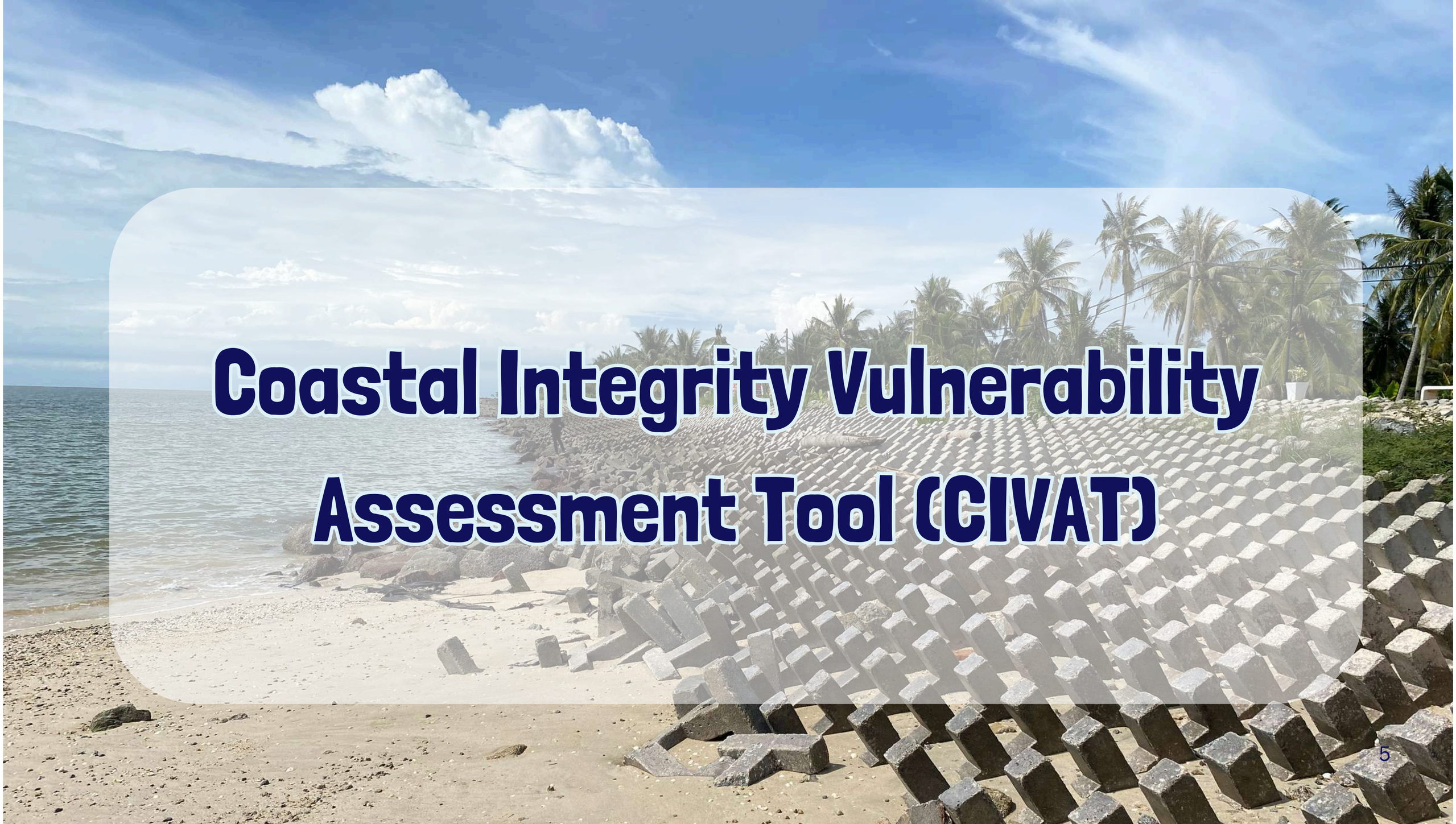
- 14

START AND END POINTS

- Start: Kuala Bagan Tiang
- End: Hutan Melintang

STUDY AREA

MU	DISTRICT	NAME	SHORE CLASSIFICATION
1	Kerian	Kuala Bagan Tiang	Mangrove Forest
2	Kerian	Sungai Betul	Aquaculture
4	Kerian	Tanjung Piandang	Mangrove forest
5	Kerian	Tanjung Piandang	Religious center
6	Kerian	Tanjung Piandang	Rock revetment
7	Kerian	Ban Pecah	Sandy beach
8	Kerian	Kuala Kurau	Fishing village
9	Larut, matang	Kuala Gula	Industrial area
10	Larut, matang	Hutan simpan Pulau Sangga Besar	Forest reserve
11	Larut, matang	Sungai Tinggi	Residential area
12	Larut, matang	Kuala Jarum Mas	Rivermouth
13	Manjung	Bagan Panchor	Jetty village
14	Manjung	Hutan Melintang	Mangrove Forest

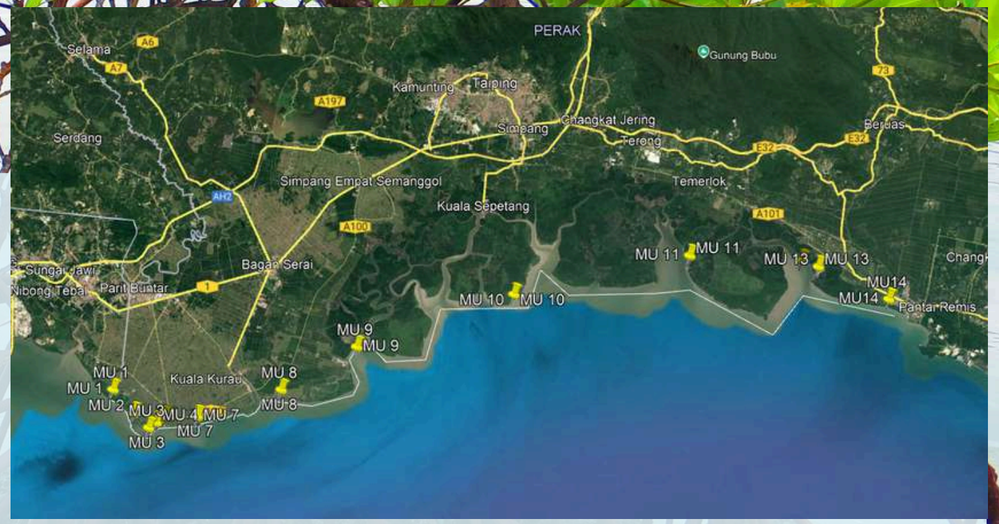


Coastal Integrity Vulnerability Assessment Tool (CIVAT)

EXPOSURE RESULTS

MU	Shore classification (Area of study)	Shoreline Distance (m)	Relative sea level change (mm/yr)	Wave exposure (REI	Tidal Range (m)	Total	Rating
1	Mangrove forest	3320.62	3	2	2	8	M
2	Aquaculture	2380.66	3	5	2	10	M
3	Mangrove forest	1.065.86	2	3	3	8	M
4	Aquaculture	335.64	2	3	3	8	M
5	Religious center	607.3	3	3	2	8	M
6	Rock revetment	3256.2	3	3	2	8	M
7	Sandy beach	9554.88	3	2	2	7	M
8	Fishing village	11020.95	3	3	2	8	M
9	Industrial area	21,429.39	2	2	3	7	M
10	Mangrove forest	21,591.11	3	2	3	8	M
11	Residential area	14, 448.67	4	2	3	9	M
12	Rivermouth	755.38	4	2	3	9	M
13	Jetty village	12334.7	4	2	2	8	M
14	Mangrove forest	5305.6	3	2	2	7	M

EXPOSURE SUMMARY



- All Management Units (MUs) show a Medium exposure rating with medium and low relative sea level change (mm/yr)
- Wave exposure is generally low and medium for all MUs due to the implementation of coastal development strategies, such as revetments, barrages, and other shoreline protections. Only MU2 (Aquaculture) has a High Wave Exposure .
- Wave height all (MUs) areas is on average 2 and 3 , with significant wave height classified as low and Medium.
- Tidal range is around 0.5-1.5m, giving North Perak coast overall Medium and low tidal rating.

- The Straits of Malacca, which shelters these districts from high wave exposure, benefits from Sumatra Island acting as a natural barrier to the west.
- The reduced wave height compared to the east coast of Peninsular Malaysia ensures relatively calmer waters. However, wave action along busy shipping routes, particularly near mangrove forests like Hutan Melintang, contributes to shoreline erosion and mangrove degradation.

ADAPTIVE CAPACITY

MU	DISTRICT	NAME	SHORE CLASSIFICATION (AREA OF STUDY)	Long-term shoreline trends (m/year)	Continuity of sediment supply	Type of coastal development	Viability of mangroves as sediment trap	Viability of mangroves as wave buffer	Mangrove canopy cover	Mangrove basal area	Total	Rating
1	Kerian	Kuala Bagan Tiang	Mangrove forest	1	5	5	5	5	5	5	31	H
2	Kerian	Sungai Betul	Aquaculture	3	3	3	3	3	3	3	21	M
3	Kerian	Tanjung Piandang	Mangrove forest	3	5	5	5	5	5	5	33	H
4	Kerian	Tanjung Piandang	Aquaculture	3	3	3	3	3	3	3	21	M
5	Kerian	Tanjung Piandang	Religious center	3	3	3	3	3	3	3	21	M
6	Kerian	Tanjung Piandang	Rock revetment	2	3	2	2	2	2	2	15	L
7	Kerian	Ban Pecah	Sandy beach	1	3	4	2	2	2	2	16	L
8	Kerian	Kuala Kurau	Fishing village	1	2	3	3	3	3	3	18	M
9	Larut, matang	Kuala Gula	Industrial area	1	5	5	3	4	4	4	26	M
10	Larut, matang	Hutan Simpan Pulau Sangga Besar	Forest reserve	5	5	5	5	5	5	5	35	H
11	Larut, matang	Sungai Tinggi	Residential area	3	3	3	3	3	3	3	21	M
12	Larut, matang	Kuala Jarum Mas	Rivermouth	5	5	5	5	5	5	5	35	H
13	Manjung	Bagan Panchor	Jetty village	1	3	1	3	5	5	5	23	M
14	Manjung	Hutan Melintang	Mangrove forest	3	3	5	5	5	5	5	31	H

ADAPTIVE CAPACITY SUMMARY

- 5 units show high adaptive capacity, 7 units medium, and 2 units low.
- Kuala Bagan Tiang and Hutan Melintang score high in total points because they have strong natural features like mangrove forests, which help as buffers against erosion and waves.
- Despite their high scores, these areas might still face challenges in maintaining sediment supply and dealing with development pressures.
- Areas like Sungai Betul, Tanjung Piandang, and others fall under the medium rating. They have some strengths (e.g., moderate mangrove coverage or sediment traps), but there are gaps in continuity of sediment supply and the type of coastal development.
- Ban Pecah score lower, meaning it might have weaker adaptive capacity due to fewer natural defenses like mangroves or sediment traps.
- Mangrove forests play a big role in increasing adaptive capacity by serving as buffers against waves and trapping sediments.
- However, human activities like aquaculture or industrial development can negatively impact some areas' ability to adapt.
- Kuala Kurau has many fisheries activities and housing estates.
- Shoreline changes in 1990-2015 recorded 12 areas experienced erosion > -1.5m/year.
- Meanwhile, 2 areas recorded accretion > 0.1m/year.

SENSITIVITY RESULTS

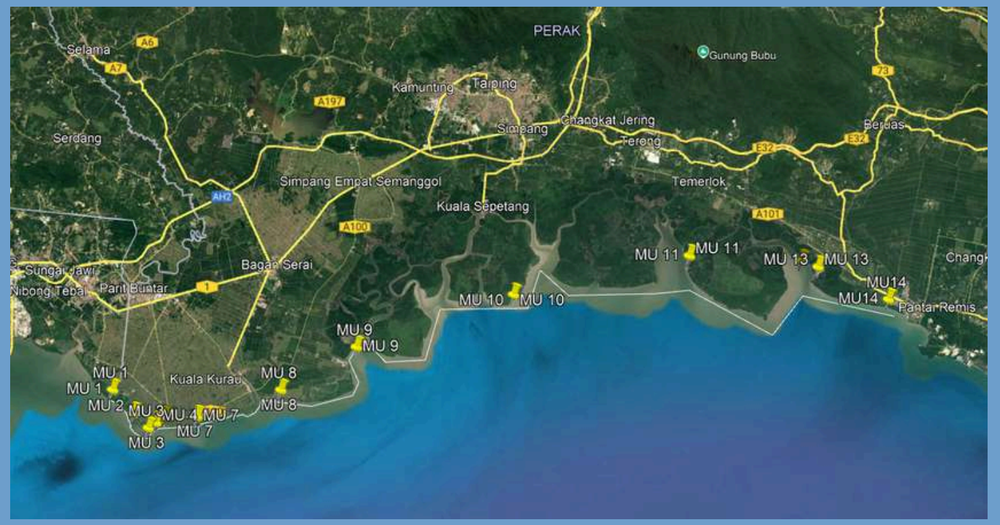
MU	DISTRICT	NAME	Shore classification (Area of study)	Coastal landform & rock type	Slope	Beach forest/ vegetation	Coastal habitat	Capacity to trap sediments	Forest type	Present vs historical mangrove extent	Mangrove zonation	Mangrove canopy cover	Mangrove basal area	Structures on the foreshore	Total	Rating
1	Kerian	Kuala Bagan Tiang	Mangrove forest	5	5	3	4	1	1	1	1	1	1	1	24	L
2	Kerian	Sungai Betul	Aquaculture	4	4	3	5	5	5	5	5	5	5	4	50	H
3	Kerian	Tanjung Piandang Perak	Mangrove forest	5	5	2	4	1	1	1	2	1	1	1	24	L
4	Kerian	Tanjung Piandang Perak	Aquaculture	4	4	4	5	5	5	5	5	5	5	4	51	H
5	Kerian	Tanjung Piandang	Religious center	3	3	5	5	3	5	3	3	4	3	3	40	M
6	Kerian	Tanjung Piandang	Rock revetment	5	5	5	3	5	5	4	4	5	5	4	51	H
7	Kerian	Ban Pecah	Sandy beach	5	5	1	1	5	3	4	5	5	5	4	43	H
8	Kerian	Kuala Kurau	Fishing village	5	5	5	2	4	5	5	3	4	3	3	47	H
9	Larut, matang	Kuala Gula	Industrial area	5	3	3	3	5	5	5	5	5	5	5	46	H
10	Larut, matang	Hutan simpan Pulau Sangga Besar	Forest reserve	4	3	5	2	2	1	1	2	1	1	1	23	L
11	Larut, matang	Sungai Tinggi	Residential area	5	3	4	5	3	5	5	4	5	5	5	49	H
12	Larut, matang	Kuala Jarum Mas	Rivermouth	5	5	2	2	3	3	3	5	4	3	4	39	M
13	Manjung	Bagan Panchor	Jetty village	5	5	5	2	3	5	2	3	3	3	4	40	M
14	Manjung	Hutan Melintang	Mangrove forest	5	5	1	1	2	1	1	1	2	3	2	25	L

SENSITIVITY SUMMARY

Sensitivity components show high sensitivity in 7 management units, 3 MUs with medium rating and 4 MUs are low rating.

Majority of sites shows high sensitivity characterised by sandy beaches and human activity center, making them susceptible to erosion.

Slope data indicates that most MUs shows gentrle slopes. The gentle slopes of majority of the sites making them prone to flood



Most of sites lack of adequate mangrove ecosystems and vegetation that are essential for sediment trap and wave buffer, increasing the coastal hazards of the area at sites such as Sungai Betul, Kuala Kurau, Tanjung Piandang and Sungai Tinggi. The absence of these critical barriers increase risk of sea level rise and vulnerability to strong waves.

Structures on the foreshore (extrinsic factor) which are human intervention including rock revetments, seawalls and jetties are prevalent in areas like Bagan Panchor and Kuala Gula. These structures can help mitigate wave impacts but also limit the natural functions of coastal ecosystems there.

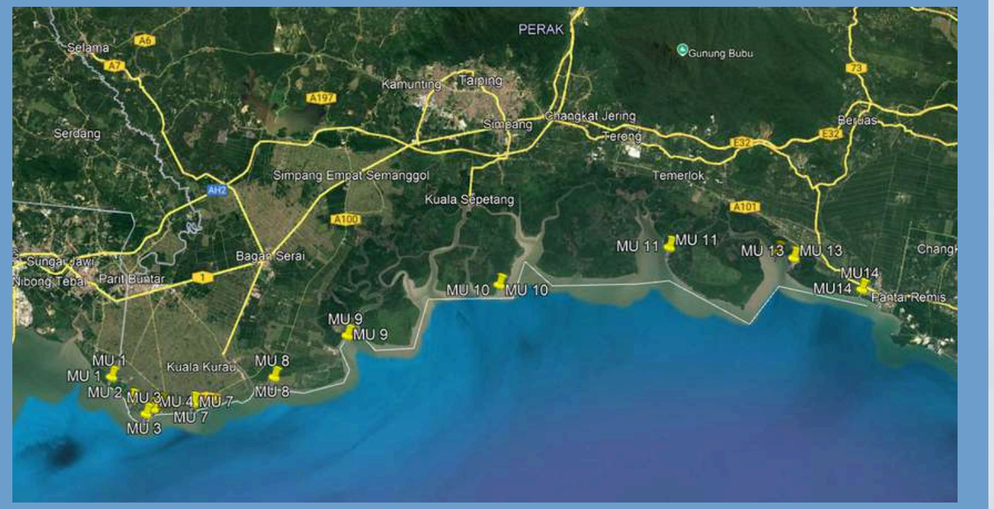
In Kuala Gula, a region within Perak known for its mangroves, community leaders report that more than 220 hectares of mangrove area have been degraded due to various factors including coastal erosion and development pressures2. This degradation has significant implications for local communities that rely on these ecosystems for their livelihoods and protection against natural disasters.

VULNERABILITY RESULTS

MU	Shore classification (Area of study)	Exposure	Sensitivity	Potential Impact	Adaptive capacity	Vulnerability
1	Mangrove forest	M	L	L	H	L
2	Aquaculture	M	H	H	M	H
3	Mangrove forest	M	L	L	H	L
4	Aquaculture	M	H	H	M	H
5	Religious center	M	M	M	M	M
6	Rock revetment	M	H	H	L	H
7	Sandy beach	M	H	H	L	H
8	Fishing village	M	H	H	M	H
9	Industrial area	M	H	H	M	H
10	Forest reserve	M	L	L	H	L
11	Residential area	M	H	H	M	H
12	Rivermouth	M	M	M	H	L
13	Jetty village	M	H	H	M	H
14	Mangrove forest	M	L	L	H	L

VULNERABILITY SUMMARY

- 8 MUs show high vulnerability towards potential impact, 1 MU show medium vulnerability while 5 MUs show low vulnerability.
- The high vulnerability MUs mostly comprises of MU that has intensive human activities, such as aquaculture, residential area and fishing village. These activities increase the potential for shoreline disruption and other coastal impacts.
- The high vulnerability MUs are also exposed to higher potential impact, particularly areas such as sandy beach or rock revetment which have higher risks of erosion and weathering. Furthermore, the coverage of adaptive capacity in these areas are not sufficient to protect the coastal line.



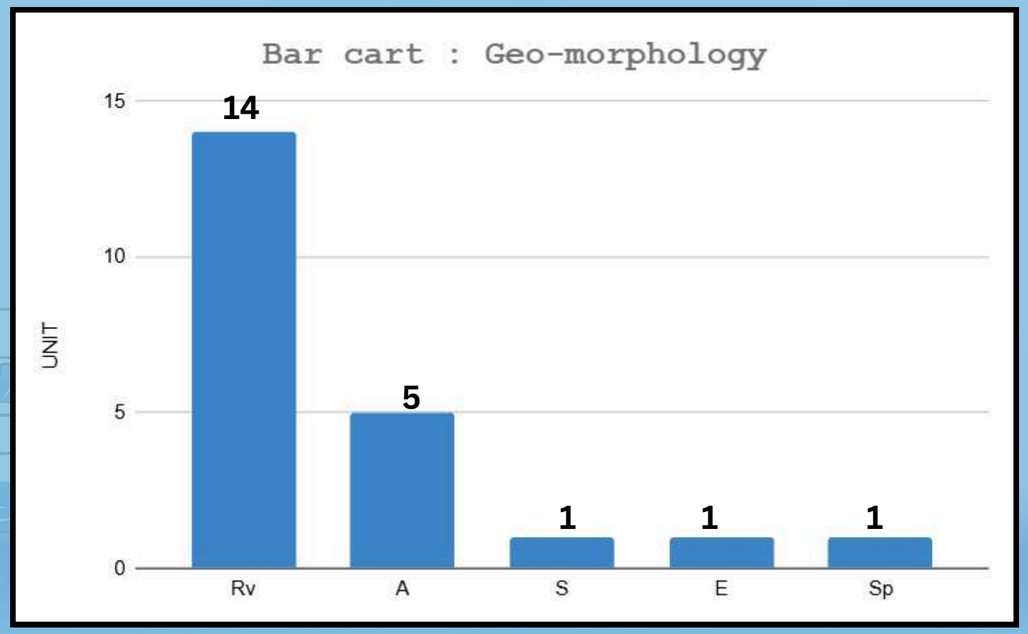
- The religious center at Tanjung Piandang have some adaptive measures, but the sedimentation is not continuous which limits the area's resilience hence it has medium vulnerability.
- Low vulnerability MUs mostly have mangrove forest or forests at the coastal area as sediment trap and wave buffer, hence it is less likely for the MU's shoreline to face disruption.

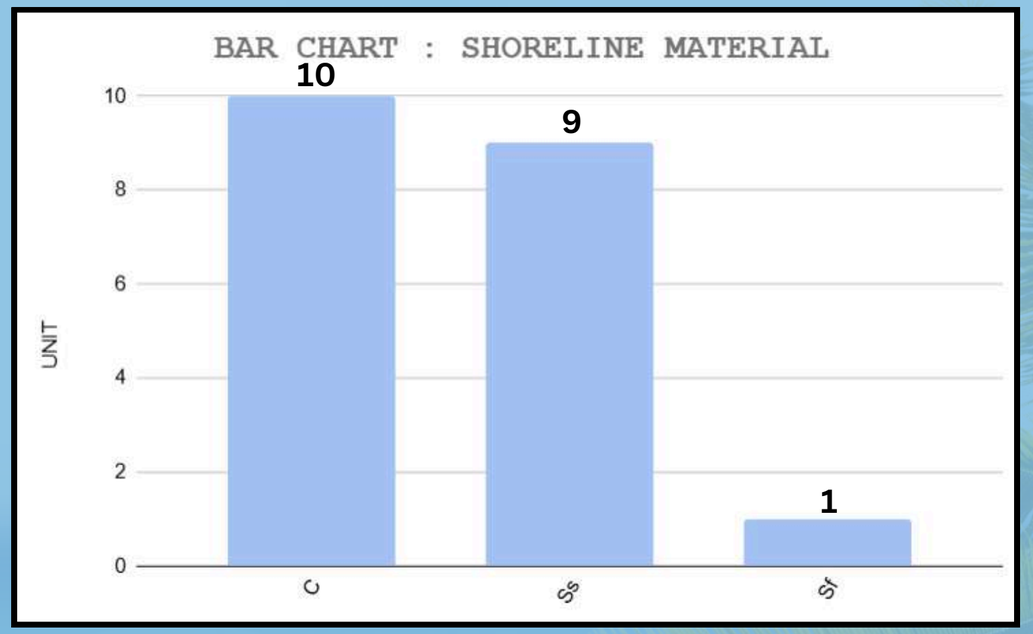
INTEGRATED SHORELINE MANAGEMENT PLAN (ISMP)

ISMP CLASSIFICATION

MU	SHORE CLASSIFICATION	SHORELINE DISTANCE (km)	GEO-MORPHOLOGY	COASTAL DEFENCE	SHORELINE MATERIALS	EROSION CATEGORY	COASTAL DEVELOPMENT SETBACK (KM)
1	Mangrove Forest	3320.62	Rv	Mangrove Replanting	Ss, C	category 3	0.4
2	Mangrove Forest, Aquaculture, Village Jetty	2380.66	Rv, A	Rock Revetment	Ss, C	category 2	0.5
3	Mangrove Forest, Aquaculture (Shrimp farm)	1.065.86	Rv	Mangrove Replanting	Ss, C	category 3	0.2
4	Aquaculture , Agriculture, Religious Place	335.64	S, Rv	Mangrove Replanting	Ss, C	category 2	0.1
5	Mangrove Forest	607.3	Rv	Mangrove Replanting	Ss, C	category 3	0.2
6	Mangrove Forest, River Mouth, Aquaculture	3256.2	Rv, E	Rock Revetment	Ss	category 1	0.1
7	Tourism, Rock Revetment, Agriculture, Rivermouth	9554.88	A, Rv	Rock Revetment	Sf	category 2	0.3
8	Jetty, Fishing Village, Rivermouth	11020.95	Rv, A	Rock Revetment	Ss	category 1	0.6
9	Mangrove Forest, Mangrove Nursery, Aquaculture	21,429.39	Rv, Sp	Rock Revetment	C	category 1	0.2
10	Reserved Mangrove Forest	21,591.11	Rv	Mangrove Replanting	C	category 1	-
11	Rivermouth, Residential Area, Mangrove Forest	14, 448.67	Rv, A	Mangrove Replanting	Ss, C	category 2	0.4
12	Rivermouth	755.38	Rv	-	Ss	category 2	0.3
13	Jetty, Rivermouth, Fishing Village	12334.7	Rv, A	Rock Revetment	C	category 2	0.5
14	Mangrove Forest	5305.6	Rv	Mangrove Replanting	C	category 3	0.4

SUMMARY





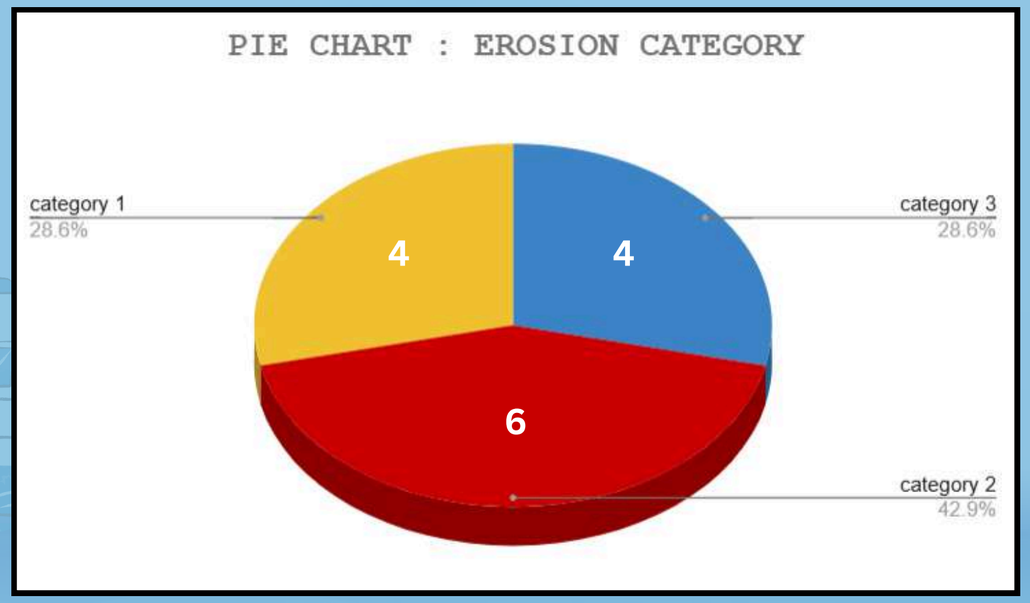
Geomorphology
The geomorphology of a coastal reach is used to describe the dominant physical forms in the reach.

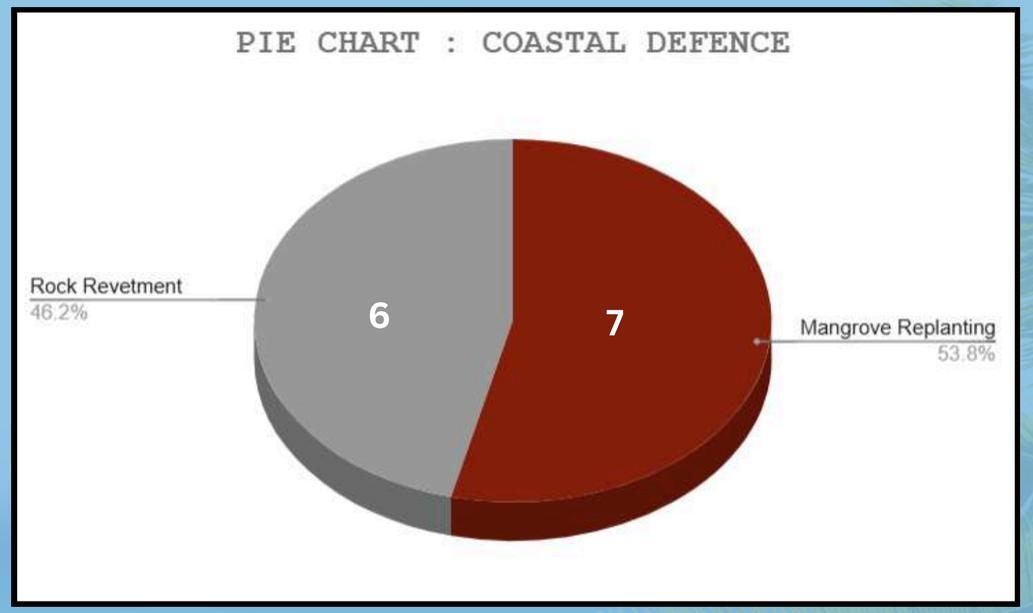
S - Straight littoral shoreline
E - Embayed shoreline
R - Rocky headland
D - Dunes
T - Tombolo or other special morphological feature
Sp - Littoral sand spit
A - Artificially protected
Rv - Riverine

Shoreline Materials
The shoreline materials parameter is a description of the type of material encountere the shore, which for the purposes of the present classification is taken as the between MLLW and MHHW. As all the sands on the North Pahang shoreline a quarts origin the differentiation between quartz and calcarite sands made in the NCI not followed in the present classification.

R - Rock
Sc - Coarse sand
Sf - Fine sand
Ss - Sandy silt
C - Silts or clay

SUMMARY





3 CATEGORIES OF EROSION - BASED ON NATIONAL COASTAL EROSION STUDY 1986

1. **Category 1** - shore-based facilities or infrastructure are in immediate danger collapse
2. **Category 2** - public property and agriculture land of value will become threatened within 5-10 years
3. **Category 3** - undeveloped shoreline experiencing erosion but no economic loss if left unchecked

Mangrove Replanting

Rock Revetment

ISMP MANAGEMENT STRATEGIES

MU	SHORE CLASSIFICATION	MANAGEMENT STRATEGIES
1	Mangrove Forest	prohibited (pvf)
2	Mangrove Forest, Aquaculture, Village Jetty	permitted (c3mh)
3	Mangrove Forest, Aquaculture (Shrimp farm)	prohibited (pvf)
4	Aquaculture , Agriculture, Religious Place	permitted (c3rt)
5	Mangrove Forest	prohibited (pvf)
6	Mangrove Forest, River Mouth, Aquaculture	permitted (c3cp)
7	Tourism, Rock Revetment, Agriculture, Rivermouth	permitted (c2mp)
8	Jetty, Fishing Village, Rivermouth	permitted(c2mh)
9	Mangrove Forest, Mangrove Nursery, Aquaculture	permitted(c3fb)
10	Reserved Mangrove Forest	prohibited (pvf)
11	Rivermouth, Residential Area, Mangrove Forest	permitted (c3mh)
12	Rivermouth	prohibited (pyn)
13	Jetty, Rivermouth, Fishing Village	permitted (c2ci)
14	Mangrove Forest	prohibited(pvf)

ISMP MANAGEMENT STRATEGIES

CATEGORY A : PERMITTED

This category covers all areas where development is "permitted" under any one of the three classes described below:

Class 1 Promoted:	Standard development controls are applied. The State takes an active role in promoting these areas to maximize the benefits that can be achieved from the coastal resources.
Class 2 Standard Conditions:	Development controls follow normal State and Federal policies concerning development approval.
Class 3 Restricted:	Very strict planning controls are required and a limited range of permissible activities are allowed.

CLASS 1 : PROMOTED

• agriculture	C1au
• high density tourism	C1gt
• low / medium density tourism	C1mt

CLASS 2 : STANDARD CONDITIONS

• agriculture	C2au
• high density tourism	C2gt
• low / medium density tourism	C2mt
• high density housing	C2gh
• low / medium density housing	C2mh
• heavy industry	C2gi
• light industry	C2ci

ISMP MANAGEMENT STRATEGIES

CLASS 3 : RESTRICTED DEVELOPMENT

(i) due to carrying capacity limitations

• high density tourism	C3gt
• low / medium density tourism	C3mt
• high density housing	C3gh
• low / medium density housing	C3mh
• light industry	C3li

(ii) due to natural, ecological or cultural resources

• coastal forest buffer	C3fb
• rural tourism	C3rt
• kampung tourism	C3kt
• traditional kampung buffer	C3kb

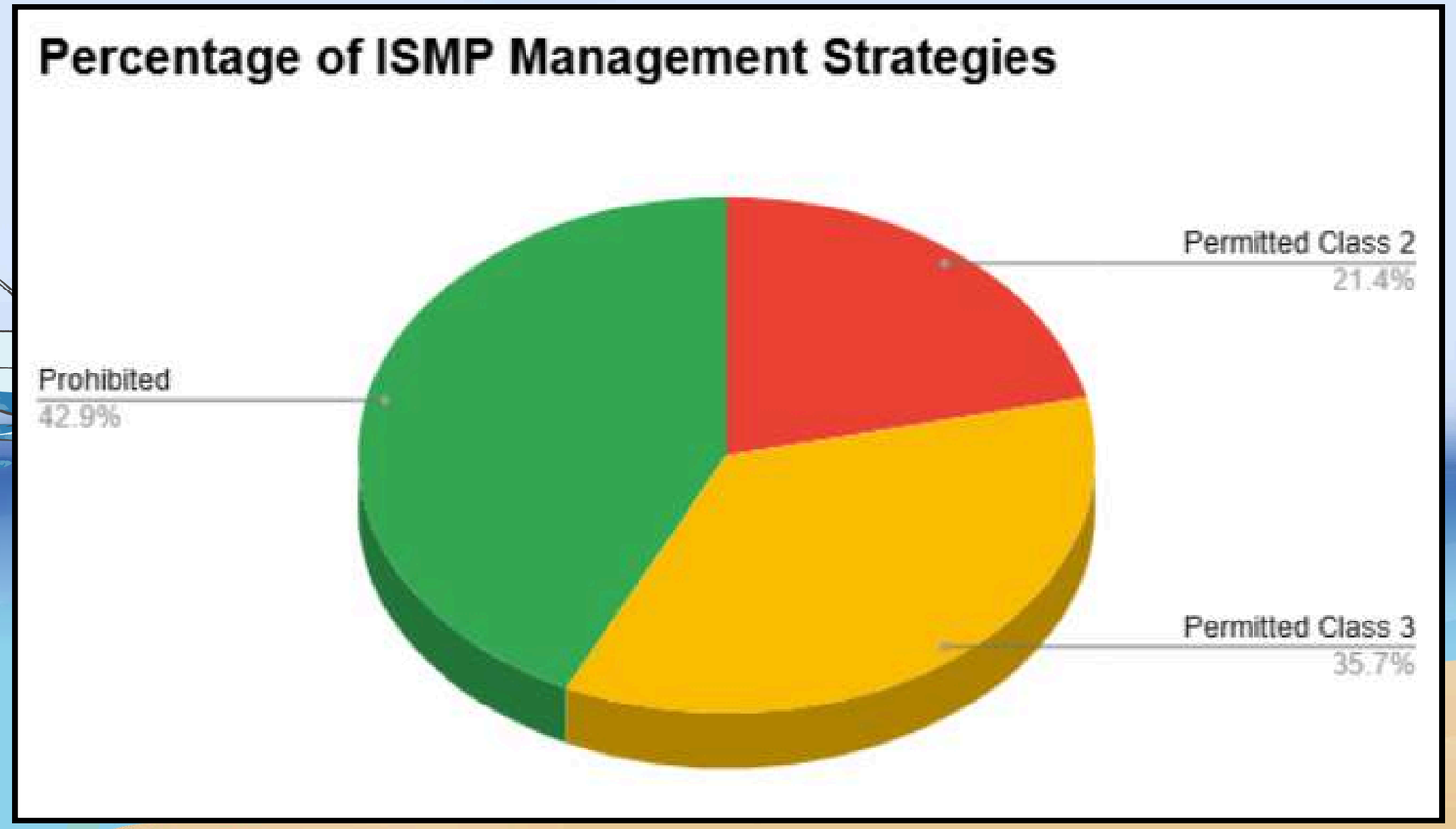
(iii) due to morphological processes or other physical or chemical constraints

• infrastructure requiring coastal protection	C3cp
• facilities requiring coastal protection	C3fp
• tourism requiring coastal protection	C3tp
• housing requiring coastal protection	C3hp
• existing or potential shoreline pollution	C3ep

CATEGORY B: PROHIBITED

• **Environmental Protection and Conservation**	
- headland forest	Phf
- mangrove forest	Pvf
- environmental conservation	Pcr
• **Active Morphology and Inundation**	**Pyn**
• **National Security Area**	**Psc**

ISMP MANAGEMENT STRATEGIES



PERMITTED

- (0) Class 1 - Promoted
- (3) Class 2 - Standard Conditions
- (5) Class 3 - Restricted

PROHIBITED

- (5) Environmental Protection and Conservation
- (1) Morphology And Inundation
- (0) National Security Area

Permitted C2
Standard Condition

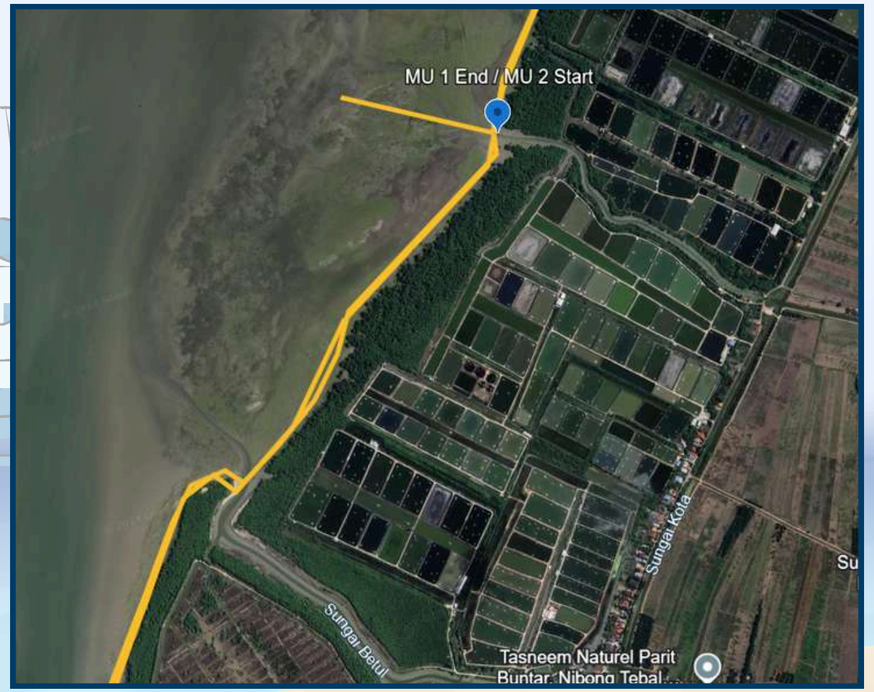
MU 7
Ban Pecah
(SANDY BEACH)

MU 8
Kuala Kurau
(FISHING VILLAGE)

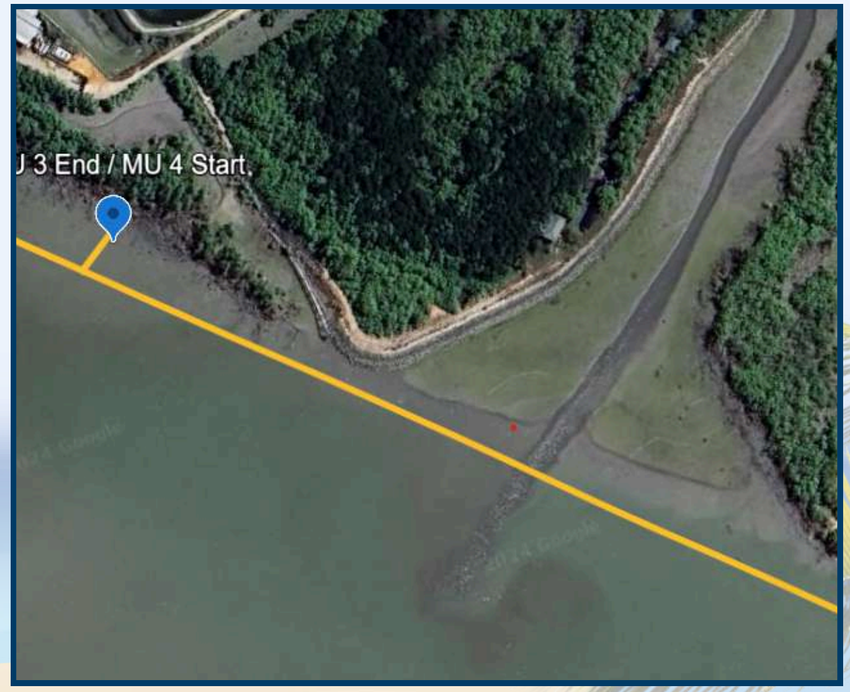
Permitted C2
Standard Condition

MU 13
Bagan Panchor
(JETTY VILLAGE)

Permitted C3
Restricted Development



MU 2
Sungai Betul
(AQUACULTURE)



MU 4
Tanjung Piandang
(ACTIVE AQUACULTURE)

Permitted C3
Restricted Development

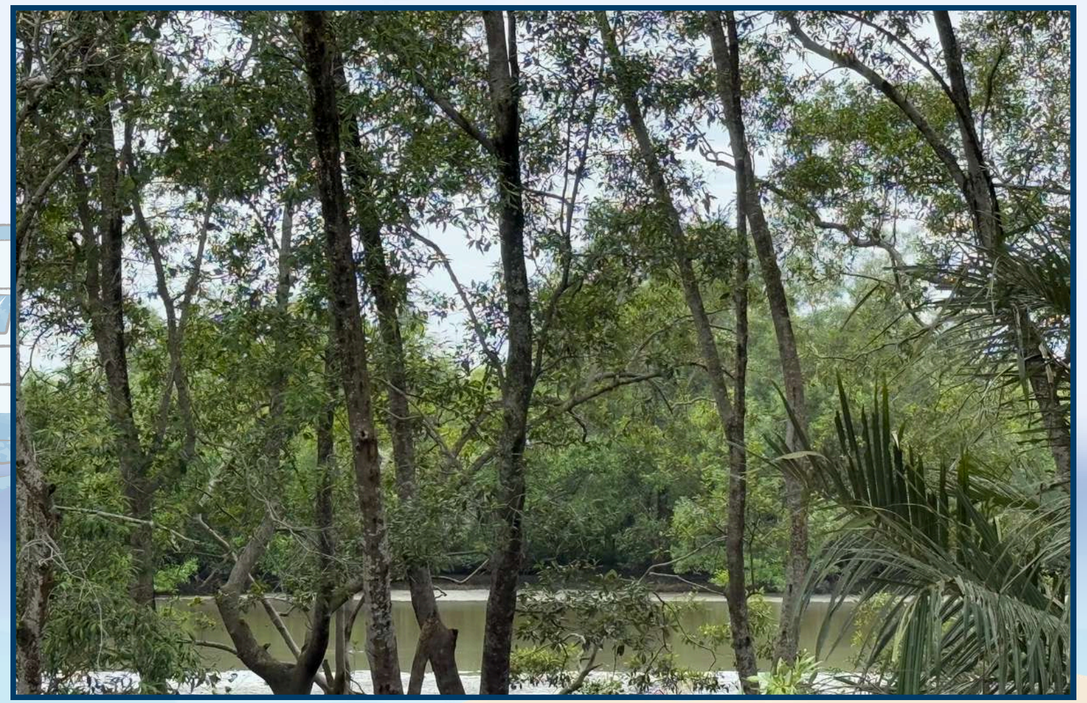
MU 6
Tanjung Piandang
(FISHING VILLAGE)

MU 9
Kuala Gula
(MANGROVE FOREST, MANGROVE NURSERY, AQUACULTURE)

Permitted C3
Restricted Development

MU 11
Sungai Tinggi
(SCHOOL AND RESIDENTIAL AREA)

Prohibited – Environmental Protection and Conservation

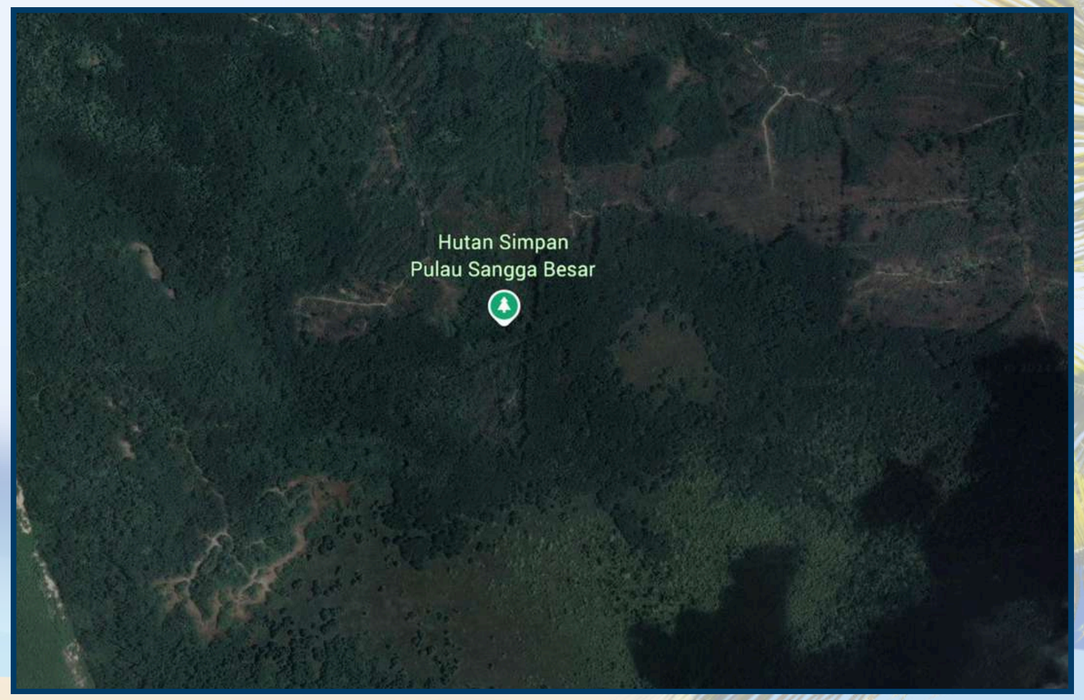


MU 1
Kuala Bagan Tiang
(MANGROVE FOREST)

MU3
Tanjung Piandang
(MANGROVE FOREST & AQUACULTURE)

Prohibited – Environmental Protection and Conservation

MU 5
Tanjung Piandang
(MANGROVE FOREST)



MU 10
Hutan Simpan Pulau Sangga Besar
(RESERVED MANGROVE FOREST)

Prohibited – Environmental Protection and Conservation

MU 14
Hutan Melintang
(MANGROVE FOREST)

Prohibited – Active Morphology & Inundation

MU 12
Kuala Jarum Mas
(RIVERMOUTH)

Issues and Problems

- ***The narrow paths and poorly structured routes*** *made the journey to the site challenging, requiring careful navigation and resulting in extended travel times. Additionally, the considerable distance between management units further prolonged travel, reducing the time available for conducting assessments.*
- ***Several management units were inaccessible*** *due to restrictions on private property, including agricultural lands, mangrove forests, and forest reserves. As a result, evaluations were based on Google Earth images and online photos.*
- ***We also had to conduct assessments from a distance*** *due to limited access to certain areas. This hindered our ability to gather detailed information about the specific conditions of the management units, potentially impacting the quality and accuracy of our evaluations.*
- ***Differences in perspective*** *emerged during the assessment process because each members had varying experiences and understandings of environmental issues. This diversity of viewpoints can lead to inconsistencies in evaluation outcomes.*
- ***The limited time for evaluation*** *may have resulted in rushed scoring, potentially affecting the accuracy of the data. The pressure to complete assessments quickly can compromise thoroughness, and a lack of experience with the scoring criteria may further contribute to inaccurate or ineffective evaluations.*

Conclusion

Key findings on:

- The current ecological conditions of North Perak's shoreline.
- The influence of natural and anthropogenic factors on coastal dynamics.

Provides a foundation for:

- Future assessments and management planning.
- Monitoring coastal vulnerability and implementing adaptive measures.

Addresses:

- Specific challenges such as erosion, sediment composition, and defense sustainability.
- The need for long-term coastal protection strategies and resilience building.

Supports:

- Efforts to enhance adaptive management practices.
- The promotion of eco-friendly development and mangrove conservation.

Encourages:

- A balanced interaction between development initiatives and the preservation of coastal ecosystems.

Thank You